

CLAIMS**What is claimed is:****[C1]**

1. A system for programming one or more parameters in an implantable device, wherein said implantable device is configured for stimulating tissue within a patient's body and said implantable device is contained within a sealed elongate housing having an axial dimension of less than 60 mm and a lateral dimension of less than 6 mm, said system comprising:

a sensor within said implantable device sensitive to the presence of an externally applied magnetic field;

a controller within said implantable device coupled to said sensor for monitoring the presence of said externally applied magnetic field and determining a timing sequence for the application and removal of said externally provided magnetic field; and wherein

said controller is configured to alter at least one programmable parameter of said implantable device in response to detection of an identifiable timing sequence of the application and removal of said externally provided magnetic field.

[C2]

2. The system of claim 1 additionally comprising:

a handheld programmer configured to be located external to the patient's body and containing a permanent magnet within; and wherein

the patient can apply and remove a magnetic field according to an identifiable timing sequence by bringing said handheld programmer in proximity and removing it from proximity of the implantable device at one or more locations external to the patient's body.

[C3]

3. The system of claim 2 wherein said handheld programmer additionally comprises a selector for altering the distance of said permanent magnet from the patient's body and thereby altering said externally applied magnetic field.

[C4]

4. The system of claim 2 wherein said handheld programmer has a first surface for presenting a magnetic field of a first polarity and a second surface for presenting a magnetic field of a second polarity, opposite of said first polarity.

[C5]

5. The system of claim 1 additionally comprising:
a handheld programmer configured to be located external to the patient's body and containing a permanent magnet within; and
a mechanism, configured for activation by the patient, within said handheld programmer configured to provide an identifiable timing sequence of the application and removal of a magnetic field.

[C6]

6. The system of claim 5 wherein said mechanism is spring powered.

[C7]

7. The system of claim 5 wherein said mechanism is electro-mechanically powered.

[C8]

8. The system of claim 1 additionally comprising:
a handheld programmer configured to be located external to the patient's body;
a coil within said handheld programmer suitable for generating a magnetic field when energized;

driver circuitry within said handheld programmer for energizing said coil;

a handheld programmer controller within said handheld programmer for generating a sequence of magnetic fields; and
a power source for powering said handheld programmer.

[C9] 9. The system of claim 1 wherein said sensor comprises a magnetoresistive sensor.

[C10] 10. The system of claim 1 wherein said sensor comprises a saturated core sensor.

[C11] 11. The system of claim 1 wherein said sensor dissipates power when sensing a magnetic field and said implantable device additionally comprises circuitry for periodically applying and removing power from said sensor and sampling said sensor during time periods corresponding to when said power is applied.

[C12] 12. The system of claim 1 wherein said sensor is configured for measuring the intensity of said externally applied magnetic field.

[C13] 13. The system of claim 12 wherein said sensor comprises a magnetoresistive sensor.

[C14] 14. The system of claim 1 wherein said sensor is configured for measuring the polarity of said externally applied magnetic field.

[C15]

15. The system of claim 1 wherein said sensor is configured for measuring the intensity and the polarity of said externally applied magnetic field.

[C16]

16. The system of claim 15 wherein said sensor comprises:
a magnetoresistive sensor; and
a bias magnet.

[C17]

17. A method for programming one or more parameters in an implantable device, wherein said implantable device is configured for modifying and/or sensing a patient's body parameter, said method comprising the steps of:

sensing the presence or absence of an externally provided magnetic field;

measuring the duration of the presence or absence of said externally provided magnetic field to determine a timing sequence; and

altering at least one programmable parameter of said implantable device according to the presence or absence of said externally provided magnetic field and the duration of said absence or presence of same.

[C18]

18. The method of claim 17 additionally comprising the step of altering at least one programmable parameter of said implantable device according to an identifiable timing sequence of the application and removal of said externally provided magnetic field.

[C19]

19. The method of claim 17 additionally comprising the steps of: sensing at least one of the following: the intensity and the polarity of said externally provided magnetic field; and

altering at least one programmable parameter of said implantable device according to sequential applications of said externally provided magnetic field wherein said magnetic field has two or more of the following distinct magnetic properties:

intensity, including absence or presence, of said externally provided magnetic field;

duration of said absence or presence of said externally provided magnetic field; and

polarity of said externally provided magnetic field.

[C20]

20. The method of claim 17 additionally comprising the steps of:
detecting the magnitude of said externally provided magnetic
field; and

altering at least one programmable parameter of said
implantable device according to the magnitude of said externally provided
magnetic field.

[C21]

21. The method of claim 17 additionally comprising the steps of:
detecting the polarity of said externally provided magnetic field;
and

altering at least one programmable parameter of said
implantable device according to the polarity of said externally provided
magnetic field.

[C22]

22. The method of claim 17 additionally comprising the step of
sequentially applying and removing a passive hand magnetic programmer
external to said patient's body according to an identifiable sequence.

[C23]

23. The method of claim 17 additionally comprising the step of
applying a magnetic programmer external to said patient's body according to
an identifiable sequence, wherein said magnetic programmer is configured
to provide an identifiable sequence of magnetic fields.

[C24]

24. A method for programming one or more parameters in an implantable device, wherein said implantable device is configured for modifying and/or sensing a patient's body parameter, said method comprising the steps of:

sensing the presence or absence of an externally provided magnetic field; and

altering at least one programmable parameter of said implantable device according to the presence or absence of said externally provided magnetic field.

[C25]

25. The method of claim 24 additionally comprising the steps of: measuring the duration of the presence or absence of said externally provided magnetic field to determine a timing sequence; and

altering at least one programmable parameter of said implantable device according to an identifiable timing sequence of the application and removal of said externally provided magnetic field.

[C26]

26. The method of claim 24 additionally comprising the steps of: sensing at least one of the following: the intensity and the polarity of said externally provided magnetic field; and

altering at least one programmable parameters of said implantable device according to sequential applications of said externally provided magnetic field wherein said magnetic field has two or more of the following distinct magnetic properties:

intensity, including absence or presence, of said externally provided magnetic field;

duration of said absence or presence of said externally provided magnetic field; and

polarity of said externally provided magnetic field.

[C27] 27. The method of claim 24 additionally comprising the steps of:
detecting the magnitude of said externally provided magnetic field; and

altering at least one programmable parameter of said implantable device according to the magnitude of said externally provided magnetic field.

[C28] 28. The method of claim 24 additionally comprising the steps of:
detecting the polarity of said externally provided magnetic field;
and

altering at least one programmable parameter of said implantable device according to the polarity of said externally provided magnetic field.

[C29] 29. The method of claim 24 additionally comprising the step of sequentially applying and removing a passive hand magnetic programmer external to said patient's body according to an identifiable sequence.

[C30] 30. The method of claim 24 additionally comprising the step of applying a magnetic programmer external to said patient's body according to an identifiable sequence, wherein said magnetic programmer is configured to provide an identifiable sequence of magnetic fields.

[C31]

31. A system for programming one or more parameters in an implantable device, wherein said implantable device is configured for modifying and/or sensing a patient's body parameter, said system comprising:

a sensor within said implantable device sensitive to the presence of an externally applied magnetic field;

a controller within said implantable device coupled to said sensor for monitoring the presence of said externally applied magnetic field and determining a timing sequence for the application and removal of said externally provided magnetic field; and wherein

said controller is configured to alter at least one programmable parameter of said implantable device in response to detection of an identifiable timing sequence of the application and removal of said externally provided magnetic field.

[C32]

32. The system of claim 31 additionally comprising:

a handheld programmer configured to be located external to the patient's body and containing a permanent magnet within; and wherein

the patient can apply and remove a magnetic field according to an identifiable timing sequence by bringing said handheld programmer in proximity and removing it from proximity of the implantable device at one or more locations external to the patient's body.

[C33]

33. The system of claim 32 wherein said handheld programmer additionally comprises a selector for altering the distance of said permanent magnet from the patient's body and thereby altering said externally applied magnetic field.

[C34]

34. The system of claim 32 wherein said handheld programmer has a first surface for presenting a magnetic field of a first polarity and a second surface for presenting a magnetic field of a second polarity, opposite of said first polarity.

[C35]

35. The system of claim 31 additionally comprising:
a handheld programmer configured to be located external to the patient's body and containing a permanent magnet within; and
a mechanism, configured for activation by the patient, within said handheld programmer configured to provide an identifiable timing sequence of the application and removal of a magnetic field.

[C36]

36. The system of claim 35 wherein said mechanism is spring powered.

[C37]

37. The system of claim 35 wherein said mechanism is electro-mechanically powered.

[C38]

38. The system of claim 31 additionally comprising:
a handheld programmer configured to be located external to the patient's body;
a coil within said handheld programmer suitable for generating a magnetic field when energized;
driver circuitry within said handheld programmer for energizing said coil;
a handheld programmer controller within said handheld programmer for generating a sequence of magnetic fields; and
a power source for powering said handheld programmer.

- [C39]** 39. The system of claim 31 wherein said sensor comprises a magnetoresistive sensor.
- [C40]** 40. The system of claim 31 wherein said sensor comprises a saturated core sensor.
- [C41]** 41. The system of claim 31 wherein said sensor dissipates power when sensing a magnetic field and said implantable device additionally comprises circuitry for periodically applying and removing power from said sensor and sampling said sensor during time periods corresponding to when said power is applied.
- [C42]** 42. The system of claim 31 wherein said sensor is configured for measuring the intensity of said externally applied magnetic field.
- [C43]** 43. The system of claim 42 wherein said sensor comprises a magnetoresistive sensor.
- [C44]** 44. The system of claim 31 wherein said sensor is configured for measuring the polarity of said externally applied magnetic field.
- [C45]** 45. The system of claim 31 wherein said sensor is configured for measuring the intensity and the polarity of said externally applied magnetic field.
- [C46]** 46. The system of claim 45 wherein said sensor comprises:
a magnetoresistive sensor; and
a bias magnet.

[C47]

47. The system of claim 31 wherein said implantable device has at least one programmable parameter having an adjustment range prescribed according to settings provided from an external programmer and wherein said controller's ability to alter said at least one programmable parameter is restricted to said prescribed adjustment range.

[C48]

48. The system of claim 31 wherein said implantable device has a plurality of programmable parameters and wherein a set of said programmable parameters are selected according to settings provided from an external programmer and wherein said controller's ability to alter said programmable parameters is restricted according to said selected set of programmable parameters.

[C49]

49. A handheld programmer for programming one or more parameters in an implantable device, wherein the implantable device is configured for modifying and/or sensing a body parameter of a patient, said handheld programmer comprising:

- a magnetic field source;
- a housing for holding said magnetic field source; and wherein said housing is configured for application to and removal from a portion of the patient's body and to enabling presenting and removing a magnetic field from said magnetic field source to the implantable device and thereby alter at least one programmable parameter of the implantable device.

[C50]

50. The handheld programmer of claim 49 wherein said magnetic field source is a permanent magnet.

[C51]

51. The handheld programmer of claim 50 wherein said housing presents two opposing faces having opposing magnetic polarities from said permanent magnet housed within to thereby permit application of differing magnetic polarities to the implantable device and to alter at least one programmable parameter of the implantable device accordingly.

[C52]

52. The handheld programmer of claim 50 additionally comprising at least one mechanism for altering the distance of said permanent magnet from the patient's body and thereby present altered intensities of magnetic field to the implantable device and to alter at least one programmable parameter of the implantable device accordingly.

[C53]

53. The handheld programmer of claim 49 wherein said magnetic field source is a coil that is electrically energizable.

[C54]

54. The handheld programmer of claim 53 additionally comprising at least one mechanism for sourcing current into said coil and thereby altering the intensity and/or the polarity of the magnetic field presented from said magnetic field source to the implantable device to alter at least one programmable parameter of the implantable device accordingly.